Infrastructure Development vis a vis Cultural Site Preservation, Indigenous People Protection, Biodiversity and the Environment of Halsema Highway Towards Safer and Greener Roads

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Abstract: Development projects, when improperly designed and inadequately planned, can damage cultural sites and structures. They diminish their value through unregulated building activities, degradation of ecosystems, environmental pollution, and/or disruption of traditional ways of life, which also create unacceptable health and safety risks for indigenous people. Often, these are cited to defer the right-of-way permission. The study aims to provide a possible long term protection of cultural heritage threatened by road projects. It is useful for any government agency involved in construction of infrastructures to come up with comprehensive background studies prior to road construction. These should include environmental assessments, biodiversity surveys, cataloguing cultural attitudes that input aesthetics and harmonious road designs to minimize impacts to heritage sites and ancestral domains with sensitive ecosystems.

Keyword: Environmental Risk Assessments, Biodiversity Survey, Archeological/ Cultural Site, Indigenous People Protection

INTRODUCTION

Country Information

The Philippines constitutes an archipelago of 7,107 islands with a total land area of approximately 300,000 square kilometers (116,000 square miles). It is located between 116° 40', and 126° 34' E. longitude, and 4° 40', and 21° 10' N. latitude. Its breadth is about 965 kilometers. The Philippine coastline adds up to 17,500 km. Three prominent bodies of water surround the archipelago: the Pacific ocean on the east, the South China Sea on the west and north, and the Celebes Sea on the south.

The topography of the bigger islands - particularly Luzon and Mindanao - is characterized by alluvial plains, narrow valleys, rolling hills and high mountains. The highest mountains are found in Mindanao and Luzon, with the altitudes varying from 1,790 to 3,144 meters. Most of the smaller islands are mountainous in the interior, surrounded by narrow strips of discontinuous flat lowlands which constitute the coastal rims. The shorelines of both large and small islands are irregular.

The Philippines is the world's 12th most populous nation, with a population of over 90 million as of 2008. An estimated figure of half of the population resides on the island of Luzon. Manila, the capital city, is the eleventh most populous metropolitan area in the world. Population growth rate between 1995 to 2000 is 3.21% but has decreased to 1.59% for 2005 to 2010.

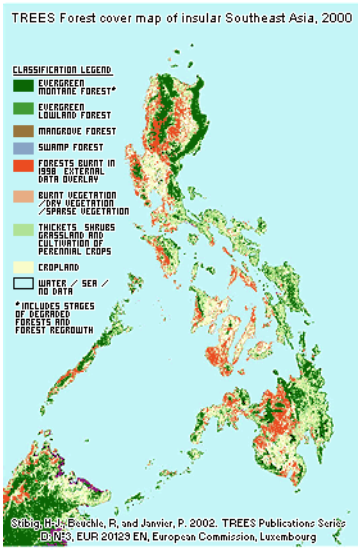
The Philippines has a tropical climate, and is usually hot, and humid. The average yearly temperature is around 26.5°C (79.7°F). There are three recognized seasons: *"Tag-init"* or *"Tag-araw"* (the hot season or summer from March to May), *"Tag-ulan"* (the rainy season from June to November), and *"Tag-lamig"* (the cold season from December to February). Annual rainfall measures as much as 5,000 millimeters in the mountainous east coast section, but less than 1,000 millimeters in some of the sheltered valleys. Sitting astride the typhoon belt, most of the islands experiences annual torrential rains, and thunderstorms from July to October.

Status of the Environment

Forest

Forest cover in the Philippines decreased from 34% in the 1970s to 22% in 1987, and remaining forest cover is concentrated in Palawan, Mindanao and the uplands of Luzon. The last forest resource inventory in 1987 showed a forest cover of 6.6 M ha, leaving 10.8 M ha of possible degraded forest land of the 17.4 M ha of designated forest land (> 18% slope). Estimates and distribution of actual area in degraded open brushlands and grasslands are highly variable. An idea of possible extent of degraded areas is

indicated by the land cover map to the left produced from SPOT images from 1998-2000. Most of the area is mountainous and faces severe erosion problems with vegetation removal. About 20 M people live and depend on the forested uplands. The main causes of deforestation and land degradation include intensive logging over decades, upland migration, agricultural expansion, development policy failures, and inequitable land distribution. Declining wood availability, heavy soil erosion and flashfloods led to logging bans on primary forests with concessions reduced to a few sustainable operations and massive reforestation efforts in the last few decades.



Water Pollution

With the rapid increase in population, urbanization, and industrialization reduce the quality of Philippine waters, especially in densely populated areas and regions of industrial and agricultural activities. The discharge of domestic and industrial wastewater and agricultural runoff has caused extensive pollution of the receiving water-bodies. Access to clean and adequate water remains an acute seasonal problem in urban and coastal areas in the Philippines. Nearly 2.2 million metric tons of of organic pollution are produced annually by domestic (48 percent), agricultural (37 percent), and industrial (15 percent) sectors. In the four water-critical regions, water pollution is dominated by domestic and industrial sources.

Air Pollution

High levels of industrial emission and the increasing number of motor vehicles seriously degraded air quality in urban areas.

Solid Waste

6,000 tons of garbage is generated daily in Metro Manila with limited and constrained disposal sites.

Total Road Length

As of July 2007, total road length and paved road ratio by road classification is as follows:

The Philippines has a network of 29,367 km of national roads with a paved ratio of 0.70 or 70% of the network. This is comprised of: (1) a national arterial network of 15,576 km with a paved ratio of 0.80; and (2) a national secondary road network of 14,371 km with a paved ratio of 0.56.We also have a provincial road network of 26, 925 km with a paved ratio of 0.20; a network of city roads of about 7,052 km with a paved ratio of 0.77; a network of municipal roads of about 15,803 km with a paved ratio of 0.34; and a network of barangay roads or farm to village roads of about 121,989 km with a paved ratio of 0.07.

Overall, the total Philippine road network is about 200,740 km with a paved ratio of 0.22.

Classification	Length (km)	Paved Road Ratio
National Roads	29,369	0.70
National Arterial	15,559	0.80
National Secondary	13,810	0.56
Provincial Roads	26,925	0.20
City Roads	7,052	0.77
Municipal Roads	15,803	0.34
Barangay Roads	121,989	0.07
TOTAL	201,138	0.23

Source: DPWH road data

The Halsema Highway

Construction of infrastructure is presently at a breakneck speed in the Philippines, due to the Government's drive to infuse economic investments and activity into the rural areas. In particular, road building has never been as active as during any other period in our history. Most of the roads being fast-tracked in the planning, budgeting and implementing stages are those that will open the hinterlands, particularly mountainous regions of the Philippine Islands. One of the biggest in scope among these road-building projects is the Halsema Highway.

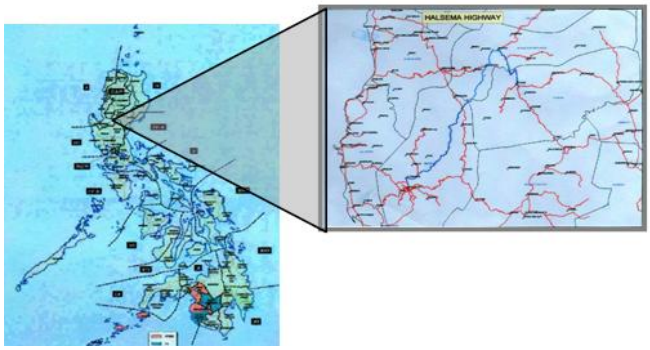


Fig. 1 Map of the Philippines. Location of the Halsema Project in the main island of Luzon

The proposed Halsema Highway is part of the Baguio – Bontoc – Banaue Road covering an approximate length of 180 km and is within the Mt Data National Park. This road serves as the principal vehicular from Baguio City to the Highlands of Benguet and Mt Province. It extends further to Banaue in the Province of Ifugao, a major tourism area. The highway also functions as the main access or spur road for the Cordillera Administrative Region (CAR) and is of strategic importance in the country's arterial road network. It runs thru mountains with limited forest cover and which appears to be geologically unstable and seismically sensitive. The road lies within a mossy forest belt which is protected and traverses the headwaters of a river supplying the Banaue Rice terraces, which are inscribed as a World Heritage Site under the UNESCO World Heritage Convention. The road itself goes thru these UNESCO rice terraces

EXISTING ENVIRONMENTAL CONDITION (Baguio- Bontoc - Banaue section)

Part of the road has been constructed across very steep terrain at 850-2350 m elevation, crossing two major ridge systems of the Central Cordilleras. The 2-lane road starts from Baguio City to the highlands of Mt. Province and extends further to Banaue, Ifugao province with a distance of 180.1 kms. The road project has steep grades and sharp curves along its mountainous section and flat sections at either end of the road segment, with rolling hills in between. The road follows the ridge alignment, hence, the number of cross drainage structures was few and there were almost no retaining walls. The side slopes of the road were fully covered by vegetation. Environmentally, the most important design parameters are road width and hillslope. Minor realignments are necessary for improved roadbench stability, considering the inherent conditions of the hillslopes, and their sensitivity to major storm and seismic events

Climate

The climate of Northern Luzon is tropical monsoonal with two wind systems, the north-east and south-west monsoons. There also two climatic conditions along the project road: Benguet and Western Mt. Province have a pronounced dry season from November to April and wet season the rest of the year. Annual precipitation is around 3563 mm in Baguio but declines northwards, and maximum daily rainfalls totals (978mm in Baguio City) approach world records.

Temperatures are moderate and elevation dependent. The highest temperatures along the road occur in Bontoc and are probably around 30degrees C. The coldest time of the year is December – January while the warmest month is April.

Winds speeds are generally low, but the region is subject to tropical storms and typhoons.

Geology

Geomorphology : the whole of the Cordillera Administrative region is characterized by mountainous terrain , with elevations reaching 2922m at Mt. Pulog (the highest peak in Luzon , and second highest in the Philippines). Surface rock types vary from sedimentary limestones through metamorphic to igneous (e.g diorite). Faulting is widespread and the region is seismically active. Precipitation is high, temperatures are moderate, and weathering is fairly rapid. The geology is complex, the mountains are young, heavily faulted, and actively eroding. Slopes are steep or very steep, and river valleys narrow. Erosion by landslide is common, now accentuated by road construction and mining and supplemented by widespread surface erosion from land recently cleared for vegetable farming.

Hydrology

The region served by the road is the headwater area for three major river systems (Abra, Chico, Agno) and many minor ones, which are vital to the environment and economy of Northern Luzon. Flows vary widely throughout the year, responding rapidly to major storm events.

Watershed condition has been severely affected by land use change over the last century, and continues to deteriorate. No basin wide landslide inventories have been carried out, so as yet it is not possible to quantify the relative contributions of roads, mines and natural failures to total sediment loads. There is a drastic increase in erosion rates due to forest removal and road construction.

Soils

Soils are of variable depth and texture, depending on parent material and location in the landscape. Soils on slopes may be developed on weathered in –situ rock or on colluvial debris, in which case horizonation is weak. Except under forest, organic matter levels are probably low due to erosion and oxidation. High precipitation results in leaching, and soils are generally acid except where influenced by underlying limestone.

Air

Air quality along road is good, except locally in La Trinidad where exhaust emissions (principally diesel) degrade air quality, and along unpaved sections of the road where dust is a severe nuisance during dry periods.

Biodiversity
Ecosystem diversity in the Baguio-Bontoc-Banaue road project has been determined to consist of four vegetation types:

Fig. 2 Mixed vegetation of grass and scattered broad-leaved shrubs and small trees extending up to 2000 masl.

Fig. 3 Open forest dominated by Pinus insularis between 1200 to 2200 masl.

Fig. 4 Montane oak forest, extending from 2500 to 2600 masl**.**

Fig. 5 Open grass-covered summit vegetation.

Among the vegetation types present in the Halsema highway road project is the montane forest that exhibits the highest plant species diversity. Herbarium surveys shows at least thirty four (34) vegetation families consisting of 60 genera which are endemic to the BBB area.[34]

Subsistence rice production is a way of life for the people of Mountain Province and Ifugao. The indigenous rice varieties planted in permanent rice terraces have to be conserved as they are woven into the fabric of the Igorot material and culture. The use of forest resources by the local communities ranges from hunting (which is the supplementary source of the indigenous peoples' protein) fire-wood gathering, and swidden farming.

More importantly the road project is expected to exacerbate the destruction of natural and critical habitats which may stem cumulatively from resource exploitation by this road project if not properly abated.

ARCHAEOLOGICAL/ HISTORICAL SITES

Ancestral Domains
The land tenure situation is complex, and reflects unresolved differences between the claim of ancestral domain by the indigenous inhabitants and eminent domain by the State .The legal corpus is steadily evolving towards recognizing ancestral land (at the individual or corporate level) and ancestral domain (tribal level), as recognized by the 1987 Constitution.

Since some three quarters of the Total land area of the Cordillera is steeper than 10 degrees, the whole region is classified as alienable and not disposable, thus dispossessing the indigenous cultural communities (ICC's) who have been living and farming in the region for centuries. To these peoples, the immediate surroundings of their villages, which include the mountains, rivers, arable lands and grazing grounds, are theirs. Traditionally, recognition of ownership over these properties was governed by traditional customs and inscribed in the collective consciousness of each generation, and not by any written patent or deed.

Projects were introduced into the Cordillera, for instance, electricity, only in recent years and are still not universal. When a series of Mega-dams were proposed for the Chico River in Mt. Province and Kalinga, the projects was successfully opposed by ICCs which had learned the power of organized protest. Since then, the Cordillera people have developed a heightened political awareness and a strong sense of their collective strength. For the past decades they have been clamoring for the State to recognize their ancestral rights over lands and resources and grant greater political autonomy. The project may directly or indirectly affect cultural heritage sites, especially those of archaeological significance. The road rehabilitation project may directly affect for example, the Ibaloy mummies of Kabayan, the burial sites of Alab in Bontoc , the Northern Kankaneys of Pingad and Sagada ; the Bontoc wet rice terraces of Alab, Samoki,Talubin and Bay-yo. For example, widening works had resulted in direct destruction of, at least, one burial site where the remains were reportedly bulldozed into the Chico River by the road contractor (Barangay Gonogon, Bontoc). Indirectly, there have been serious impacts on other cultural heritage sites since the road was opened in 1930, in particular, theft and vandalism of many of the Timbac Mummies (Reconnaissance Cultural Heritage Survey).

Tribal Groups

The resident population is almost entirely Cordilleran ethnic stock, Ifugao in Ifugao Province, Bontok in eastern Mt. Province, Kankaney in Northeastern Benguet and Western Mt Province and Inibaloi in Benguet. This mountain region is home to a number of Indigenous Cultural Communities (ICC's) which have retained the distinct customs and practices governing their relationship with one another and the environment. They have been able to do so by successfully resisting the onslaught of colonial influences, unlike their lowland neighbors.

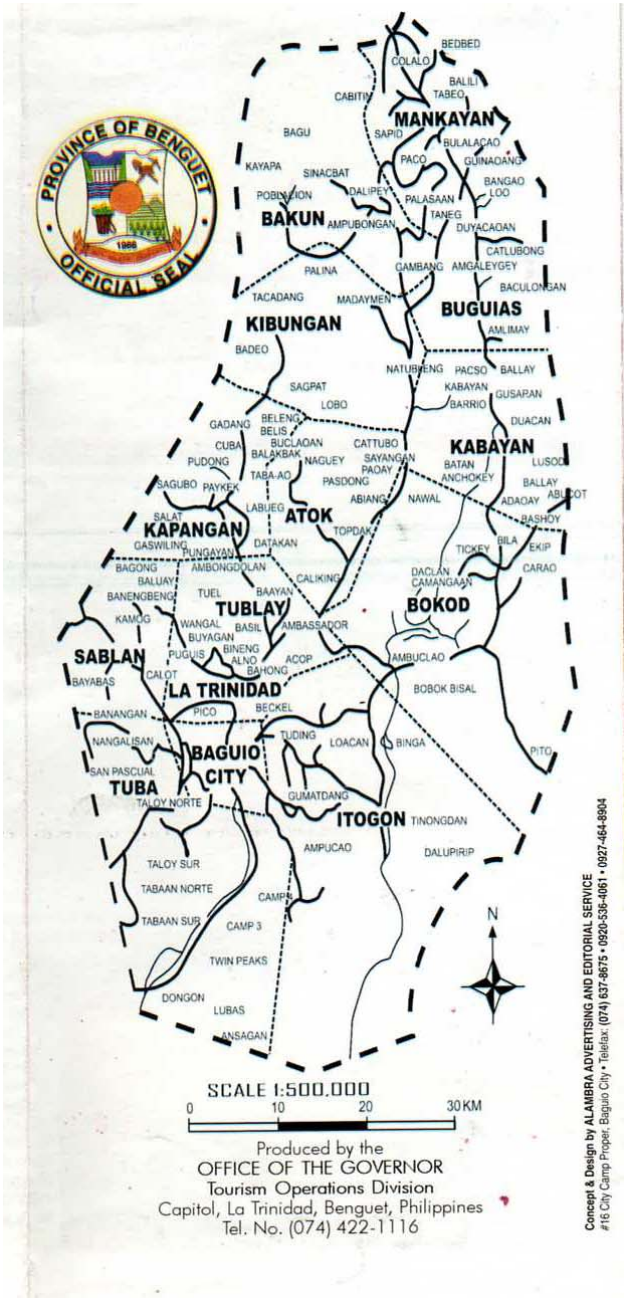


Fig. 6 Distribution of Tribal Groups in the Cordillera

In varying degrees, traditional institutions still pervade the social and political life of the communities (Ili), particularly in the interior areas. In Kabayan and Bokok, the Lalakay (old men) and Babbaket (old women) still play a dominant role in community decision making. In northern Benguet and southwestern Mt Province, the Dap-ay which is composed of old men of known wisdom and stature, plays a crucial role in decision making and in settling disputes and dispensing justice. The same is true for the Ator in Bontoc and Eastern Province. In Ifugao, close family ties dictate the settlement pattern of the indigenous groups in the province.

Traditional social organizations remain strong in Mt Province, less so in Ifugao, and are weak in Benguet .

Fig. 7 Some tribal groups in the Cordillera

ENVIRONMENTAL RISK ASSESSMENT

Biodiversity Assessment

The road has had severe negative effects on the region's ecology, both directly through erosion and subsequent sediment impacts on watercourses, and indirectly through habitat loss (forest clearance), probably exacerbated by water pollution by pesticides.

As an example, the mossy forest has been almost totally cleared from Mt. Data National Park, despite its biological and hydrological importance. Anecdotal evidence suggests micro-climatic change (fewer frosts; reduced cloudiness) at Mt. Data as a result.

The Philippine archipelago is noted for both a high absolute biodiversity and a high level of endemic species. The majority of the flora and fauna is dependent on the original forests, and many of the endemic species are threatened with extinction due to forest degradation and loss (Jensen et al. 1994).

The mossy forest is recorded as supporting 285 vascular plants, and the pine forest, grassland and gullies a further 169. There are some 89 species of pteridophyte (fern) in the region. Mt Pulog and by extension the similar environment of the Mt. Polis area has been recognized as a "Centre of Plant Diversity and Endemism" in a global survey (Davis et al 1995). There are also many local strains of staple crop plants; the reconnaissance survey reports ten native varieties of rice, and ten of sweet potato (camote).

The mountains of northern Luzon have been identified as an Endemic Bird Area of global importance by the International Council for Bird preservation (Bibby et al. 1992). Of the 33 Philippine endemic bird species reported from the project area, 10 are endemic to Luzon only. In addition, it is also noted for its endemic muridae (rats and mice), which have evolved spectacular forms with limited distribution.

The main threats to the biodiversity of the region are habitat loss and hunting. The key faunal habitat is the remaining mossy forest which despite its hydrological and biological importance is itself globally threatened (Hamilton 1995). The project road traverses mossy forest for 15 km from km 365 -350 (8% of its total length).

Benguet Province has been hardest hit by deforestation. There has been almost total forest loss on the Mt Data ridge due to unregulated conversion to vegetable farms (gardens): mossy forest cover in the 55 km^2. Mt. Data National Park is now less than 0.8 km^2. Forests on the Mt Pulog / Mt Polis ridge east of the Agno and Chico rivers are in better condition, but are severely threatened, as a result of the construction of access roads from the Agno valley (Jensen et al 1994).

The mammalian fauna of the area includes 42 species of which 27 are endemic to the Cordillera, Luzon or the Philippines. The 18 species of rodents (mice and rats) have evolved to occupy specific ecological niches e.g the bushy-tailed and slender-tailed cloud rats (*Crateroys Schandebegi* and *Phloeomys Pallidus*), which are among the most spectacular and attractive rodents in the world (Oliver et al 1993). The largest mammalian group are bats (24 of the 47 mammalian species are bats , of which 10 are Philippine endemics). The caves of the Sagada area may contain a unique assemblage of bat species.

The region has a rich bird fauna (164 species of bird have been recorded in the Cordillera). The Philippine or Red Crossbill is of special interest insofar as it is the characteristic bird of the Benguet pine forest , living exclusively on pine cones , and found nowhere else (Bodner 1986).

Very little is known about the riverine and aquatic ecology of the area, although nine species of fish have been recorded from the region, four indigenous and five introduced for food (Bodner 1986). At least one indicator species, the endemic Luzon Water –redstart "Rhyacornis bicolor (a which requires clear, fast flowing mountain streams) is undergoing a severe population decline, and is now classified as threatened.

Preservation of Protected Areas

The Halsema Highway runs through some 97.5 km through Mt. Data National Park. The remainder of the Highway, as far as Bontoc, lies within the Central Cordillera Forest Reserve which was declared in 1929.

Three quarters of the Bontoc – Banaue road lies within the Bontoc-Ifugao Forest reserve which overlaps the Chico River Forest Reserve and Central Cordillera Forest Reserve (DENR 1997). The mossy forest in this stretch, on the Mt. Polis Ridge, is protected under National Integrated Protected Areas (NIPAS) legislation.

At Banaue, the road runs immediately above and through terrace systems of the "Rice Terraces of the Philippine Cordilleras "World Heritage Site". This site, the first world heritage site in the Philippines, comprises clusters of rice terraces at Banaue (Batad and Bangaan), Mayoyao, Kiangan, and Hunduan. The site was inscribed under the UNESCO World Heritage Convention in the category of "Cultural Landscapes" in December 1995.

The road also runs close to or influences two other existing or proposed protected areas: the existing 115 km^2 Mt. Pulog National Park, and the proposed 120 km^2 Mt. Calawitan National Park.

Biodiversity in the region is high, with many rare and endangered species of animal (and plant) living in or dependent on the old-grown mossy forest. This habitat is under severe pressure from clearance for subsistence and commercial agriculture. Hunting is widespread.

Archaeological /Historical Sites Survey

A review of ethnographic and archaeological literature, Philippine laws pertaining to protection and preservation of cultural heritage, field reconnaissance survey, and consultations with people, revealed two existing types of cultural heritage namely: burial sites, and irrigated rice terraces (payo), which are potentially at risk, directly or indirectly as a consequence of the road rehabilitation. Table 1 lists some of these.

Table 1 Cultural Heritage Sites along Project Road

Approx. Station (Km)	Description	Threat
La Trinidad		
303 + 700	Timbac Mummy Caves: National Cultural Treasure	Indirect threat of vandalism, theft from increased unmanaged tourism; also deterioration due to micro-climatic change following forest loss.
363 + 300 to 365 + 600 367 + 100 to 369 + 000	Scattered rice terraces by road in Barangays Camatagan, Namatec, Pingad, all in Sabangan Municipality	Direct threat from current road widening
366 + 600	Stone coffins by road at Barangay Pingad	Direct threat from current road widening
378	Rock shelter burial sites with coffins at Barangay Gonogon	Destroyed: bulldozed into Chico River during recent road widening.
383 + 100	Pine coffins on LH side of road in Brgy Alab Ganga Burial Cave & Petroglyphs, 2.5 Km from Alab; National Cultural Treasure	Direct threat from road widening; also seepage from canal Indirect threat of vandalism, theft from increased unmanaged tourism
385 + 000	Sagada burial caves, hanging coffins, subterranean streams: National Cultural Treasure	Indirect impacts of increased tourism
Bontoc		
385 + 800 to 830 + 500	Rice Terraces of Brgy Samoki	Direct Threat fro road Widening
374 + 000 to 372 + 200	Rice Terraces of Brgy Talubin	Direct threat from road widening
370 + 300 +to 366 + 500	Rice terraces of Brgy Bay-yo	Direct threat from Road widening
345 + 600 + 341 + 000	Rice terraces of Banaue: National Cultural Treasure and World Heritage Site	Direct treats from Road widening, sedimentation of irrigation water, indirect threats from vegetable industry and loss of traditional values.
Banaue		

Source : Reconnaissance Cultural Heritage Survey

Table 2 Impacts of Roads

Environmental Action or Feature	Effect on Environment
Physical Environment	
Dust	Dust from unsurfaced sections of road is major nuisance to road users, roadside residents.
Slope Failure	Erosion, increased instability, siltation of watercourses, direct and indirect impacts on water supplies
Road widening	Past and on going widening carried out without geotechnical assessment has a major destabilizing effect on slopes
Spoil disposal downslope	Loss of vegetation, erosion, gullying, burial of fields, siltation of watercourses
Roadside quarrying	Slope destabilization erosion

Inadequate/poorly designed/poorly maintained drainage	Localized flooding erosion at outfalls, gullying, siltation of watercourses
Water pollution by sediment	Disruption destruction of aquatic environment and fauna due to erosion, spoil disposal, siltation
Biological environment	
Loss of forest cover and slope vegetation	Direct loss of habitat & wildlife, slope destabilization and disruption especially at Mt Polis, conversion of forest to vegetable farms
Water pollution from Pesticides	Disruption/destruction of aquatic environment and fauna, health effects on human population , especially in Benguet
Human Society	Loss of traditional sense of identity, health and social problems, violation of rights to participate in development

CONCLUSION

Road building should therefore include environmental impact assessments pertaining to physical environment, biodiversity surveys, sociological assessment covering surveys of archeological and historical sites and native social structures. This is to obtain flexibility in imposing designed standards on infrastructure projects within areas of significant historical/ biodiversity/ cultural significance; to ascertain the negative impact of infrastructure projects are mitigated; to conserve/ preserve the balance of environmental, agricultural, and socio-cultural factors while meeting the demands of modernization

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